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Nutritional analysis of diets searched on the internet and potential health impacts

Análise nutricional de dietas buscadas na internet e potenciais impactos na saúde

Abstract

Introduction: Desire to lose weight has been influencing people to search for restrictive diets. The Internet facilitates access to diets focused mainly on weight loss. *Objective*: This original research work aimed to analyze menus of the most searched diets by internet users. *Method*: A search with the word "diet" was conducted in Google Trends, and the most searched diets on the internet between September 2019 and September 2020 were selected, as follows: egg diet, USP diet, Dukan diet, and Sirtfood diet. A search for menus of each one of them was performed, as well as analysis of energy content, the corresponding percentage of protein, lipids, carbohydrates, and fiber, calcium, iron, vitamin C, vitamin A, and vitamin E composition, with the help of the Avanutri software. *Results*: It was possible to verify that most diets are very restrictive regarding daily energy supply (396.6 to 1326.58 kcal), stimulate a great restriction of carbohydrates (except Sirtfood diet phase 1) and high protein consumption (20-45%), which is accompanied by high intake of lipids (14-47%). Concerning micronutrients, menus showed insufficiency in the daily supply of vitamins A (except Dukan phase 2 and USP diet), C (except egg diet and Sirtfood phase 1), D, E, besides calcium (except Dukan phase 2), and iron. *Conclusion*: Besides potential risks that an imbalanced nutrient composition may cause, diets with a restrictive profile do not lead to the development of healthy eating habits and may result in the development of an obsessive relationship with food. Although initial weight loss may occur, weight loss is not sustained.

Keywords: Internet. Diet. Caloric Restriction. Weight loss. Nutrients.

Resumo

Introdução: O desejo de perder peso tem feito com que pessoas recorram a dietas restritivas. A internet é um meio propagador e facilitador de acesso a dietas voltadas principalmente ao emagrecimento. *Objetivo*: O trabalho teve como objetivo analisar alguns dos cardápios das dietas mais pesquisadas pelos usuários da internet. *Método*: Foi realizada uma busca com a palavra "dieta" no Google Trends, a partir da qual foram selecionadas as dietas mais procuradas na internet entre os meses de setembro de 2019 a setembro de 2020, sendo elas: dieta do ovo, dieta da USP, dieta Dukan e dieta Sirtfood.

Realizou-se a busca por cardápios de cada uma delas, bem como a análise da composição em energia, a porcentagem correspondente de proteínas, lipídeos, carboidratos, e a composição em fibras, cálcio, ferro, vitamina C, vitamina A e vitamina E, com o auxílio do *software* Avanutri. ***Resultados***: Foi possível verificar que as dietas são restritivas em relação à oferta diária de energia (396,6 a 1326,58 kcal), estimulam grande restrição de carboidratos e o alto consumo de proteínas, o qual é acompanhado da alta ingestão de lipídeos. Em relação aos micronutrientes, a análise dos cardápios mostrou insuficiência na oferta diária das vitaminas A (exceto Dukan fase 2 e dieta USP), C (exceto Dieta do ovo e Sirtfood fase 1), D, E, além de cálcio (exceto Dukan fase 2) e ferro. ***Conclusão***: Além dos potenciais riscos que o desequilíbrio na composição em macro e micronutrientes podem causar, dietas com perfil restritivo não levam ao desenvolvimento de hábitos alimentares saudáveis e podem resultar no desenvolvimento de uma relação obsessiva com a alimentação. Ainda que o emagrecimento inicial possa ocorrer, a perda de peso não é sustentada.

Palavras-chave: Internet. Dieta. Restrição calórica. Perda de peso. Nutrientes

INTRODUCTION

A healthy and balanced diet is essential to promote health. The proper dietary practice considers biological and social aspects of the individual, meeting special dietary needs, respecting food culture, being accessible from the physical and financial point of view, harmonious in quantity and quality, meeting principles of variety, balance, moderation, pleasure, and are based on appropriate and sustainable production practices.[1]

The frequency of overweight among Brazilian adults is 55.4%, being slightly higher among men (57.1%) than among women (53.9%). In turn, the frequency of obese adults is 20.3%, being similar in male and female subjects.[2] Although overweight occurs among men and women, it is undeniable that women suffer the greatest pressure to conform to an "ideal" standard of beauty. In this idealized standard, the thin body is a central pillar, which may contribute to increasing adherence to extreme weight control behaviors and excessive concern with body image, which may result in inappropriate eating behaviors.[3]

The Internet has become an abundant and accessible source of health information, among which food and nutrition are of great interest. Information about diets that meet different goals, particularly that of weight loss-related content, is present in countless Internet-based platforms.[4] Through the Internet, different vehicles disseminate an unrealistic aesthetic model and weight loss-related content, targeting especially adolescent girls and adult women.[5] In this context, the indiscriminate practice of diets without scientific basis, disregarding physiological, psychological, and social particularities, has been gaining more prominence. Most people who decide to follow them have as their main purpose to change their body shape in a short period. It is common to adhere to restrictive menus, with the exclusion of different food groups, exaggerated decrease in energy value, absence of professional help, and the promise of fast results.[6]

Therefore, this study aimed to perform a nutritional analysis of some of the menus of the most searched diets by internet users in Brazil, as well as discuss potential health risks they may offer.

METHODS

This is a descriptive cross-sectional research, whose stage was carried out using a search engine, Google Trends,[7] a tool provided by Google that allows tracking the number of searches for a keyword in a defined period. Google Trends brings estimates that permit the dimensioning of search trends on themes of interest, broken down into geographic boundaries, thematic categories (health, for example), temporal boundaries, and produces a trend graph of the searched topic over the selected period. In this case, the corresponding term for "diet" in Brazilian Portuguese was searched for from September 2019 to September 2020 and the filtered country was Brazil. The diets selected in this study were the most frequently searched by internet users throughout the requested period.

After selecting the diets, a search for menus published on the web was performed, as well as for instructions on how these diets should be followed. Much of the information, such as the diet menus, was obtained from lay literature since there is no scientific literature available on these recommendations. Additionally, the nutritional assessment and prescription software Avanutri®, version 4.0, was used to analyze nutritional composition. In each diet, a proposed menu was analyzed. Those composed of more than one phase, as is the case of Dukan and Sirtfood, more than one menu was analyzed. Total energy provided by proteins, lipids, carbohydrates, and fiber composition, calcium, iron, vitamin C, vitamin A, and vitamin E were evaluated. Verification of the adequacy in macronutrient composition considered the adult recommendations of carbohydrates (45-65%), proteins (10-35%), and lipids (20-35%), according to the Acceptable Macronutrient Distribution Ranges (AMDRs), recommended by the Institute of Medicine.[8] Micronutrient composition was analyzed considering the Dietary Reference Intakes (DRI) values recommended for women between 19 and 50 years old. The values considered were the following: calcium (1000 mg), iron (8 mg - men and 18 mg - women), vitamin A (900 mcg - men and 700 mg - women), vitamin C (90 mg - men and 75 mg - women), vitamin D (15 mcg), and vitamin E (15 mg). In the

case of fiber, we considered the recommendation of the Cardiovascular Prevention Guideline of the Brazilian Society of Cardiology - SBC, which recommends the intake of 25 g/day.[9]

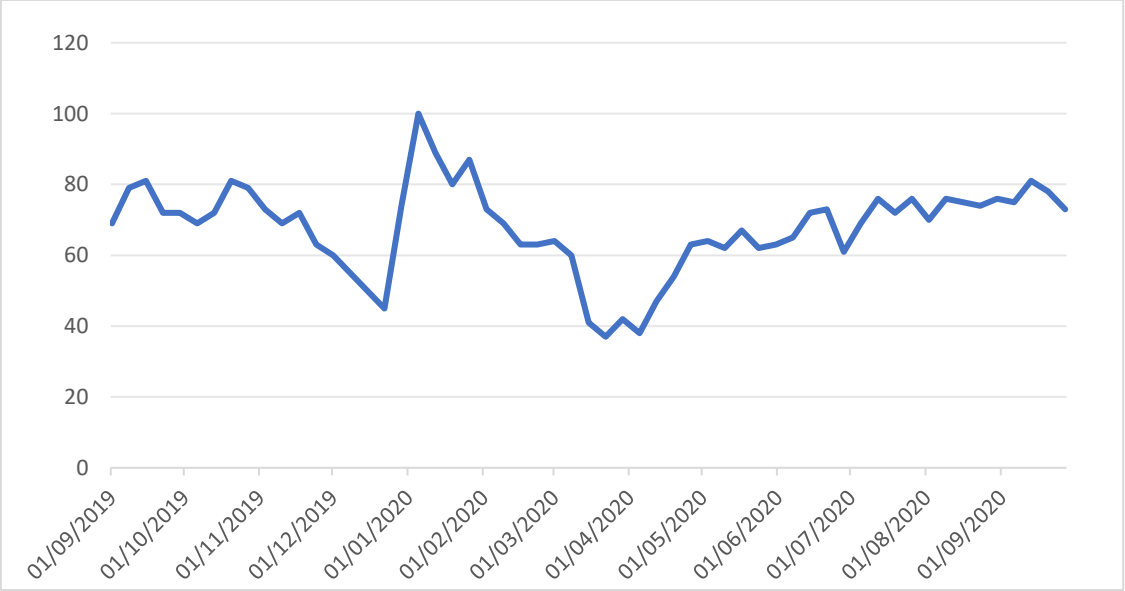
RESULTS

After a Google Trends search, it was verified that the most searched and accessed diets were Egg diet, Dukan diet, USP diet, and Sirtfood diet. Next, the main characteristics and analysis of the nutritional composition of the menus will be presented.

Diet search trends throughout the requested period

Figure 1 presents the trends on the topic searched from September 2019 to September 2020.The numbers represent the search interest relative to the highest point on the graph. A value of 100 represents the peak popularity of the term "diet", which occurred in January 2020. A value of 50 means that the term was half as popular. April 2020 was the month of least interest in the search for diets.

Figure 1. Diet search trends throughout September 2019 to September 2020.



Source: Google Trends

Characteristics of the diets and menus

Egg diet

The egg is the central food of this diet, and such conduct is justified by the satiety it may provide. It is a low-calorie menu based on the consumption of eggs, associated with other protein food and/or food with low glycemic value and low

in fat. It is suggested to last one to two weeks and advertised weight loss ranges from 3 kg in 7 days, and 10 to 14 kg in two weeks of follow-up.[10] Only water and natural teas are allowed to be consumed between meals. This diet does not permit the consumption of foods such as potatoes, rice, and bread, as well as meats with higher fat content, processed foods, fried foods, fast foods, soft drinks, juices, and foods with sugar.[11]

The suggested and analyzed menu in this research was composed of three meals a day: at breakfast, hardboiled eggs (two units) and a fruit serving (one apple); at lunch, hardboiled eggs (one unit) and chicken fillet (one unit); and at dinner, hardboiled eggs (two units), salad (one cup), and a citric fruit (one unit).[10]

Dukan Diet

Among the diets sought, the best known is the Dukan diet, which was developed by a French doctor, Pierri Dukan. It is a weight-loss method based on reducing the consumption of carbohydrate-rich foods, compensating for this lack in the consumption of protein and oat bran to increase satiety. The claimed effect of such a weight loss plan, predominantly hypocaloric and ketogenic, is a loss of five kg already in the first week. This diet does not set a deadline for completion and has four phases: attack, cruise, consolidation, and stability. The first two phases are aimed at losing weight, and the other two are aimed at stabilizing the weight, without dietary restrictions.[12]

The "attack" phase lasts up to seven consecutive days and in it you are allowed to consume only animal protein at will, in addition to one and a half tablespoons of oat bran a day. Sweeteners such as aspartame and spices are also allowed. To analyze this phase of the diet, a menu consisting of six meals was used: breakfast, consisting of skim milk (200 ml glass), oat bran (one and a half spoons), egg (one unit), and 0% fat white cheese (two slices); morning snack skimmed natural yogurt (170 ml) and low-fat ham (two slices); lunch with filet mignon (150 grams) and omelet (one egg yolk and two egg whites); afternoon snack with 0% fat white cheese (one medium slice) and low-fat ham (two slices); at dinner, a meal with shredded chicken and fine herbs (eight tablespoons) and 0% fat cottage cheese (two shallow tablespoons); supper: chamomile tea (one cup).[13]

Analysis of a proposed menu for the "cruise" phase was also performed and consists of 6 meals: breakfast consisting of light fruit yogurt (170 ml), boiled egg (one unit), black coffee without sugar (one cup), and oat bran (two tablespoons); morning snack: cherry tomato (four units) and 0% fat white cheese; lunch: arugula (one cup), tomato (one unit), ground beef (150 grams), cooked carrots (half unit), and sauteed green beans (one cup); afternoon snack: light Polenguinho (processed cheese) (one unit), natural 0% fat yogurt (170 ml), and celery (three sticks); dinner: baked hake with rosemary (one filet), cooked chayote (half unit), and palm heart pupunha (half unit); and supper: lean ham (two slices).[13]

According to the diet proposal, the consolidation and stability phases would be less restrictive. However, in the last phase, one day a week should be reserved for protein intake only, in addition to the consumption of three oatmeal spoons with the meals.[12]

USP Diet

Despite its name, this diet has no connection with the University of São Paulo (USP). It is a very restrictive diet, with poorly distributed meals and a menu consisting of little variety of foods, preferably those low in carbohydrates.[14] This diet can last one week and last up to 14 days, with the promise of losing up to 14 kg. Physical activity is not recommended due to reduced calorie intake and, consequently, energy loss.[15]

The basic menu consists of only three meals: Breakfast, which consists of black coffee without sugar (one cup), raw carrot (one small unit), and Tahiti lemon (one unit); lunch, which is only grilled chicken fillet (one unit), and dinner: boiled egg (two units) and boiled carrot (one large unit).[14]

The Sirtfood Diet

Composed mainly of foods that would allegedly activate pathways of what is known as "lean gene" or sirtruins, the same pathways related to fasting diets.[16] The diet plan is based on two phases and promises a loss of at least 3kg in the first week. In the first three days (phase 1), the number of calories allowed is up to 1,000 kcal per day. The food composition of these first days consists of three green juices and one meal.[16] The only meal present in these first three days, lunch, can be arranged as follows: grilled salmon with olive oil and lemon (one 120-gram filet), butter cabbage (two leaves), capers (two spoons), and red onion (a quarter unit).[17] From the fourth to the seventh day the food intake changes to up to 1,500 kcal daily, divided into two green juices and two meals (phase 1.2). The authors claim that despite calorie restriction, these foods naturally have the effect of satiating hunger.[16]

After seven days, phase 2 begins and lasts for another 14 days. This second stage has one more meal: dinner. Lunch can consist of the same foods and quantities as in the previous stage. Dinner, based on allowed foods and calorie limitation, is as follows: chicken fillet (one large unit), arugula (three leaves), and olive oil (one tablespoon).[17]

Analysis of dietary recommendations and nutritional composition

Table 1 shows some recommendations related to the number of meals on each menu, total follow-up time of the diets or diet phases, as well as promised weight loss in each one of them and daily calories. It is possible to notice that the Dukan Diet menu has in its structure a number of 6 meals a day. Among all the proposals, the Sirtfood diet in its phases 1 and 1.2 is the most restricted concerning the daily number of meals. The consumption of juices is recommended in these phases, which was not considered as a meal. Sirtfood phase 2, USP, and the egg diet have a menu proposal of three meals a day. Recommended follow-up time is quite variable. In total, the Sirtfood diet is recommended to be followed for 21 days, and there is no specification as to how many kilos will be lost. Regarding calories, an average value is 806.5 kcal/day (minimum 396.6 kcal; maximum 1,326.6 kcal/day). Among all of them, the USP diet is the one with the most restrictive menu proposal regarding calories, and the one that promises the greatest weight loss, about 14 kg, in approximately two weeks.

Table 1. Number of meals, follow up period, promised weight loss and total energy value in analyzed diet menus. Brazil, 2020.

	Number of meals a day	Follow-up time	Estimated Weight loss	Energy (kcal/day)
Egg diet	3	1 to 2 weeks	3 a 14 kg	674
Dukan diet phase 1	6	Up to 7 days	Up to 5 kg	1326.6
Dukan diet phase 2	6	Until desired weight is reached	Not especified	1078.8
USP diet	3	Up to 14 days	Up to 14 kg	396.6
Sirtfood diet phase 1	1	3 days	Not especified	578.9
Sirtfood diet phase 1.2	2	4 days	Not especified	751.4
Sirtfood diet phase 2	3	14 days	Not especified	839.3

The estimated macronutrient composition of the analyzed menus is shown in table 2. It is possible to verify that, as far as protein is concerned, there is no insufficiency in the supply in any of the analyzed menus. On the contrary, it is possible to observe that most of them exceed the upper recommended percentage limit (35%). In contrast, except for phase 1 of the Sirtfood diet, all diets offer carbohydrates below the lower recommended limit (45%). Regarding the percentage of lipids, except for Sirtfood phase 1.2, all of them meet or even exceed the recommendation of 20-35%, which is a consequence of protein recommendation. All the menus analyzed offer insufficient amounts of fiber, and in the case of Dukan phase 1, this nutrient is almost nonexistent.

Table 2. Macronutrient and fiber estimated composition of the diet menus. Brazil, 2020.

Dieta	Protein (g)	%	Carbohydrate (g)	%	Lipid (g)	%	Fiber (g)
Egg diet	61.41	37	41.08	24	29.41	39	5.1
Dukan diet phase 1	148.0	45	28.0	8	69.38	47	1
Dukan diet phase 2	107.20	40	56.87	21	46.95	39	9
USP diet	42.97	44	21.16	21	15.56	35	4.9
Sirtfood diet phase 1	19.56	20	94.68	66	9.12	14	5.7
Sirtfood diet phase 1.2	76.48	40	63.85	34	21.08	25	4
Sirtfood diet phase 2	64.80	31	72.23	34	32.35	35	11.2
DRIs (2006)/SBC(2019)*	-	10-35	-	45-65	-	20-35	25*

Concerning micronutrients, menus show an insufficient supply of vitamin A, except for Dukan phase 2 and USP; vitamin C, except for the egg diet and Sirtfood phase 1; all of them with insufficient supply of vitamin D and E, only Dukan phase 2 with an adequate composition in calcium, and all of them insufficient in iron (table 3).

Table 3. Micronutrient estimated composition of the diet menus. Brazil, 2020.

Diet	Vitamin A (mcg)	Vitamin C (mg)	Vitamin D (mcg)	Vitamin E (mg)	Calcium (mg)	Iron (mg)
Egg diet	662.2	136.4	3.2	5.8	185	5.5
Dukan diet phase 1	446.1	12.4	2.9	9.4	861.2	9
Dukan diet phase 2	1686.9	42.2	1.9	1.9	1135.3	10.5
USP diet	5039.0	6.9	1.5	4.6	117	3.4
Sirtfood diet phase 1	565.2	79.4	3.6	5.1	157	2.9
Sirtfood diet phase 1.2	466.1	58.5	4.1	8.6	154.6	4.3
Sirtfood diet phase 2	343.7	43.1	1.5	7.8	218.5	6.4
DRIs (2006)	700 mcg	75 mg	15 mcg	15 mg	1000 mg	18 mg

DISCUSSION

Adequate and healthy eating should contemplate biological and social aspects, being harmonic in quantity and quality, attending to the principles of variety, balance, moderation, and pleasure. Such aspects should not be disregarded when the individual wishes to lose weight.

The Internet has become an abundant and accessible source of health information and is a conducive environment to the spread of false promises of quick, easy, and sustained weight loss. The trend of interest on diets searched online indicated seasonality and the beginning of the year corresponded to the peak of interest. In a previous work about content conveyed by news and interest for fad diets in Google Trends, the search for fad diets was influenced by news, many of which include media personalities, a fact that would contribute to arouse the interest of Internet users to the fast weight loss warnings. The peak of attention occurred mainly between September and January with eminence in the months close to the end of the year, which could be described as a kind of "summer effect" or "end-of-year festivities effect". Furthermore, the most searched diets, similarly to the present study, were those restricted in calories and/or that emphasized the minimum consumption of carbohydrate-source foods and high intake of protein sources.[18]

In this study, when analyzing each menu, it is possible to notice that poor distribution in the number of meals is present in all diet plans. Except for the Dukan diet, in which the menu structure consists of six meals, others varied from one to three meals a day. More fractionated menus may result in better regulation of insulin levels and provide greater satiety, which may contribute to increased efficacy and acceptance of diets.[19]

Regarding time to weight loss, all diet plans analyzed promised considerable weight loss in a short period. By checking the total energy value of the menus, we noticed that the fast weight loss promised is based on a pronounced calorie restriction. The diets analyzed have energy values between 396.6 and 1,326.58 kcal per day. Balanced hypocaloric diets should provide a minimum of 1,000 to 1,200 kcal/day for women and 1,200 to 1,400 kcal/day for men, and should allow food variety, nutritional adequacy, facilitate adherence, resulting in small but sustained weight loss. Except for the Dukan diet and Sirtfood phase 2, all diets fall into the "very-low-calorie diets" group, i.e., they provide approximately 400 to 800 kcal per day. It is important to note that such restrictive diets should be followed for a limited period under professional guidance, and are contraindicated for people with unstable heart disease, severe heart failure, cerebrovascular disease, acute and chronic renal failure severe or end-stage liver disease, psychiatric disorder, and side effects may include fatigue or weakness, dizziness, constipation, dry skin, hair loss, menstrual changes, and intolerance to cold, and the most serious side effects are the development of gout and gallstones. Thus, following diets without proper monitoring represents a real health risk.[20] In a study on fad diets performed with patients in a nutrition outpatient clinic, 27.5% reported having followed diets published in magazines and without professional monitoring, and almost 73% considered the results as bad or very bad and reported side effects such as weakness, irritability, dizziness, headache, among others.[21]

Besides health risks they may offer, it is important to consider that calorie restriction, although it may be accompanied by weight loss and improvement in LDL cholesterol levels, triglycerides, blood pressure, and insulin resistance, is associated with reductions in energy expenditure, i.e., there is a clear adaptation of metabolism to calorie restriction. Calorie restriction does not seem interesting from energy an expenditure perspective and, consequently, maintenance of lost weight.[22] It is also relevant to highlight that weight loss is related to water loss and muscle mass reduction, with the maintenance of body fat, i.e., a negative change in one of the most important components of energy expenditure: body composition. The abovementioned changes favor the occurrence of weight loss-gain cycles known as weight cycling or "yo-yo dieting".[23]

Another observation is that analyzed diets, except for Sirtfood phase 1, restrict carbohydrate consumption, overemphasize protein-rich foods, which also contribute to high lipid intake, and have a low supply of foods that are sources of fiber. This result corroborates the findings of previous research that analyzed diets published in magazines directed to the female public and websites.[24-26] The premise of carbohydrate restriction is because glucose is the main

insulin secretagogue, an anabolic hormone whose function, in general, is to inhibit the breakdown and promote nutrient storage. Hence, carbohydrate restriction and consequent reduction in insulin levels would increase lipid oxidation and reduce fat stores.[27] However, severe carbohydrate restriction may result in chronic ketoacid production, in addition to bone mineral loss, hypercholesterolemia, increased risk of urolithiasis, and altered central nervous system function, since brain cells rely exclusively on glucose as an energy source.[8] Despite the claim that a low-carbohydrate diet would increase appetite and a high-fat diet would decrease it, evidence shows that there is no difference in appetite or sense of well-being.[20]

Regarding micronutrients, menus showed an insufficient daily supply of vitamins A (except Dukan phase 2 and USP diet), C (except egg diet and Sirtfood phase 1), D, E, besides calcium (except Dukan phase 2), iron, and similar results were found in previous studies.[19,28,29] Overall, this insufficient micronutrient supply could lead to vision problems, reduced antioxidant defenses, affect bone mineralization, and cause anemia.[8] Diets low in carbohydrates and high in fats, especially saturated cholesterol, are also high in animal protein and deficient in vitamins A, B6, and E, folate, calcium, magnesium, iron, potassium, and fiber.[19]

Besides the possibility of micronutrient deficiency or negative effects associated with high consumption of protein and lipid sources, or carbohydrate restriction, impacts of a restrictive fad diet can be more far-reaching. In general, restrictive diets force their followers to ignore hunger signals. Hunger signals are linked to satiety signals therefore, these diets can compromise the individual's perception of satiety, which can lead to lack of control, compulsions, and, in susceptible people, can precipitate the occurrence of eating disorders or risk behaviors for the development of these disorders.[30] Dietary restrictions, whether self-imposed or suggested by professionals, can negatively impact eating behavior and this needs to be considered. The practice of restrictive diets and body dissatisfaction are important triggers for anorexia nervosa, bulimia nervosa, and binge eating disorder. Beyond the impacts on physical health, it is essential to consider the possible consequences of such diets on eating behavior and psychosocial functioning.[31-33] Therefore, such conduct should not be indiscriminately encouraged and in a non-individualized way. On the contrary, they should be considered as unhealthy practices for weight control and, hence, should not be seen as solutions to body weight-related problems.

CONCLUSION

The most searched diets on Google Trends are composed of rigid, monotonous food plans, focused only on the quantity and/or quality of food. To achieve the weight loss goal, it is worth "skipping meals", restricting or prohibiting the consumption of what is considered "fattening" and counting the calories of each meal. Diets with a restrictive profile do not lead to the development of healthy eating habits and can even result in a progressive exclusion of foods considered as villains as well as the development of an obsessive relationship with food.

All diet menus were nutritionally unbalanced and disregard fundamental aspects such as biological individuality, food preferences, socioeconomic conditions, and lifestyle. Initial weight loss may happen for some, however, the chance of weight regain is real and, as time goes by, new attempts with "new" diets become more difficult and stop working, leading to great frustration.

An intense dietary restriction can lead to persistent changes in eating behavior, which can have a deleterious impact on the lives of people who search for such weight control practice. The online search for unbalanced diets, not individualized, without proper guidance from a nutritionist, cannot be trivialized and treated as something harmless. Such practice has been strongly propagated on different internet platforms, being stimulated by cultural values about the ideal of body and health, still strongly linked to the thin body. Women are the main victims of this beauty model propagated by the media, and this contributes to associating their self-esteem to their appearance. The weight loss with such diets, if it

occurs, is transitory, and recovery of the lost weight is likely. However, the intensification of dissatisfaction with one's own body, as well as the emergence of a dysfunctional relationship with food, may be difficult effects to be reversed.

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Contributors

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